

PROTECTIVE ADAPTATION AMONG SOME INDIAN SPIDERS.

BY

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(*With one photo and 3 text-figures*).

Nature, a mother kind alike to all, has bestowed on every living being a special virtue by which it is enabled to thrive, to obtain its sustenance and to protect itself from its enemies. In some animals defence takes the form of extreme swiftness of movement, some have warning colours, some the power of mimicry, and others resort to one or the other of the hundreds of different devices and modifications. Innumerable examples of such adaptations are found in the insect world. Among spiders, which form the subject of this article, many interesting examples of protective adaptation are found. But as these creatures are generally looked upon with horror and repellant, few care to observe the instinct displayed by them. A study of the varied habits of spiders does in itself provide to the Naturalist an ample field which has been explored only imperfectly so far.

Though most of the familiar orders of spiders are represented abundantly in India, many Indian species still remain unidentified and even some of the orders are omitted altogether. To a certain extent this incomplete taxonomical study renders it difficult for the field naturalist to describe comprehensively the habits of all the spiders that he comes across during his collection work. However enthusiastic a collector may be, unless he familiarizes himself at least with the generic names of the specimens he secures, he cannot write a comprehensive and detailed account of their habits although he may know for himself that 'X' specimen behaves this way and 'Y' specimen in that. With regard to such Indian spiders as the Hersiliids, Attids, Thomisids and Theridiids the above difficulty is felt much as the literature concerning them is scarce.

Apart from the scientific classification, based on their habits Spiders can be grouped under the following heads:—

I.—SEDENTARY SPIDERS.

(Including Argyropids, Theridiids, Pholcids and Eresids).

II.—ROVING SPIDERS.

- (a) Hunting Spiders or Wolf Spiders (Lycosids).
- (b) Jumping Spiders (Attids).
- (c) Bark Spiders (Hersiliids).
- (d) Grass Spiders (Oxyopids).
- (e) Crab Spiders (Thomisids).

I.—SEDENTARY SPIDERS.

Sedentary spiders construct webs of their own and reside within.

Among the snare builders Argyopids are the most common and abundant in our gardens. They construct beautiful circular snares with geometrical precision. A careful study of an Argyopidean web reveals that almost always its foundation lines have direct connection with the leaves of the plant or tree by whose side the web is located. The slightest disturbance on any part of the web is telegraphically conducted by the radii to the central hub where the spider usually sits. If the source of disturbance is an enemy, the spider with electric speed rushes to the contiguous leaf and hides on the underside, failing which, it abruptly drops to the ground and disappears. On the other hand, if the shaking of the web is caused by the struggle of a captive insect, which has accidentally fallen on it, the spider at once approaches the prey along one of the radii, binds its legs and wings with a profuse flow of silk from the spinnerets and drags it to the centre. Sometimes at the sight of an enemy, the Argyopid purposely vibrates its web with such an astonishing speed that both spider and web are rendered invisible. In a way this swinging action enables the spider to secure its prey, for, if the glutinous threads happen to touch the insects flying near the web, they are instantaneously caught.

These methods of capturing their prey and concealing themselves from enemies are the characteristics of Argyopids in general. Besides these, special adaptations of both protective and aggressive significance are also found in some of the Argyopidean genera.

Its huge black body with deep yellow bands and its scarlet mandibles, make *Nephila maculata* such a formidable and grotesque creature that it is rightly called the Giant Wood Spider. If at all the common enemies of Araneids, like the birds and lizards, prey upon this series they would do so only with shuddering qualms. The orange bands on the body of the common Argyope and the white drawings on that of *Epeira diadema* must have also a protective significance. Another common species met with in our gardens, especially during the rainy season, is the *Tetragnatha*. Its small cylindrical body assists it to a great extent in concealing itself from its enemies. Approached by an enemy, it at once runs to hide itself on the underside of the nearest leaf by assuming a peculiar linear position (see figure). Some species of *Tetragnatha* are dull green in colour which serves as an additional protective advantage. *Leucauge*, a genus closely allied to *Tetragnatha*, behaves in a similar way. Some species of *Leucauge* found in India are light green in colour and successfully harmonize with the surrounding verdure. The common *Gastercantha* with its small dark rhomboid body and minute legs resembles a chip of wooden bark suspended in air. Epeirans often sit motionless in the axils of leaves folding their legs in such an artistic fashion that they appear at first sight to be lifeless objects. Some of them rest on branches of trees imitating patches of lichen growth, while other members (*Caerostris*) living on the bark of trees are easily mistaken for woody knots,

Theridiids agree to some extent in their general habits with the Argyropids. They also are good web builders; but their webs are made of irregular threads without any geometrical plan. They are common both in gardens and in corners of houses. They are mostly of small size and more secretive in habit than the Argyropids. When chased they instantaneously sham death, a device which to some extent enables them to escape attack.

Pholcids are represented abundantly in India. They are a tribe of harmless spiders, shy by nature, occupying safe and unfrequented localities such as the roofs and rafters of old houses, and never venturing to stir out of their irregular webs. Perhaps their long legs prevent them from falling a prey to their enemies. A pholcid caught by the legs generally escapes by shedding the limb or limbs.



Nest of Eresidian spider.

The common Indian Eresids, belonging to the genus *Stegodyphus*, are also sedentary spiders constructing a very complicated type of nest. A peculiarity with these creatures is that they are very social, a number of them forming a colony and living in a single nest. Such a social life is found nowhere else in the Araneid world. The architecture of the Eresidian web is entirely different from that

of other spiders. It is saccular in appearance and consists of numerous chambers perceptible from outside in the form of small round apertures. The nests are usually found fixed to the extremities of the branches of trees and bushes or along fences (*vide* photograph). Sometimes, attached to the main nest is an extensive net whose threads are arranged irregularly in a vertical and horizontal fashion, not concentrically, as with Argyopids. Insects that fall into this net seldom escape from its highly viscid threads. The grey colour of the Eresidian web agrees with the colour of the spiders and it is only with some difficulty that they can be detected within their webs. At the sight of an enemy they retreat deep into the concavity of their nest which, due to its complicated structure, is impervious to the attack of birds and dragon flies. Again, the fibres of the nest being highly sticky, birds generally do not tamper with it.

II.—ROVING SPIDERS.

The Roving Spiders are not sedentary but hunt in search of prey. Though generally not web builders like the sedentary tribes, some weave small patches of web during certain stages of their life. The females weave such webs for the protection of their cocoons during the breeding season. Again, during the moulting period they construct webs and remain sedentary till the critical phase is safely passed. Even during other periods many possess permanent abodes for retirement.

Of all the roving spiders perhaps the most cunning and powerful are the Lycosids. From their voracious habits and perseverance in making expeditions in search of prey they are called Wolf Spiders or Hunting Spiders. Examples of various modes of life are found within this group. Many of them build no snares, yet are vigorous hunters running zig-zag along the ground. Some like *Lycosa amandalei* are amphibious in habit. *Hippasa pantherina* is a species which constructs intricate webs and is mostly of sedentary habits.

Hippasa generally builds its abode in burrows in the ground, in natural crevices by the buttress roots of trees, or among the whorls of the suckers of the *Pandanus*. The webs are cylindrical and are often an inch in diameter. The tube runs into the ground vertically to a depth of about 9 inches and bends at an obtuse angle. The spider sits at the mouth of its web, a vigilant sentry, but at the sight of man or an enemy it immediately recedes to the bent portion of the tube. Pursued further, it rushes to the deepest recess and is completely out of sight.

One peculiarity with regard to the Lycosids in general is that when hunting they never move straight but go zig-zagging, stopping here and there in the manner of a fly. This deceptive resemblance to the movements of a fly is supposed to be both aggressive and protective.

Some Lycosids are capable of staying below water for more than 20 minutes. They live in small holes near water

and evade their enemies by diving in. They creep down the stems of aquatic weeds and plants to hide, if chased further, they sham death, fold their limbs, drop into the water and float on the surface. They feed on aquatic flies, and some are said even to hunt small fishes.

Jumping Spiders come under the Order *Attidae*. Attids are ubiquitous and are found commonly on walls and in corners of houses, among plants, on tree trunks—everywhere. All of them are of moderate or small size, but they differ much in colour and habits. Mimicry of the most wonderful type is present in this group. They perform surprising acrobatic jumps to escape from their enemies.

Once, while passing along a foot-path near a fence, I was attracted by the inflorescence of a plant. It appeared at first sight to consist of white and black flowers. On examination, however, what appeared to be black flowers proved to be dead bees. The problem of how these dead bees came to be there puzzled me. I scrutinized every part of the plant and at last was able to find out. Hidden under the small flowers were three small Attid spiders, beautifully coloured with metallic blue and white stripes which, with their minute legs, resembled floral stamens. One of them was actually sucking a bee at the time. Hence there could be no doubt that the dead bees were the remains of the meals of these spiders. This illustrates how, not only Thomisids, but also Attids practise the same method of capturing prey, by hiding inside flowers. This kind of protective adaptation has a dual advantage: the spiders avoid the notice of their enemies and at the same time get their food ready at the door.

In the case of *Myrmarachne*, which is an Indian ant-mimic spider, 'the mimicry is so perfect that quite often it requires the second glance of even an experienced collector to distinguish one of these spiders from the ants amongst whom they are often seen moving about'. There is some controversy with regard to this ant-mimicry. Is it protective or aggressive? No doubt, ant-mimicry has its protective value, but does it necessarily follow that it has no aggressive value because the mimics do not feed on the models? In the false garb of an ant, the spider may feed on other minute insects which are not attacked by ants. By their shy nature and quick movements coupled with their mimicry, the ant-mimics successfully evade their enemies.

Attids, though termed vagabonds, and typical roving spiders, more often than not weave a small patch of membraneous canopy for retirement. During breeding time this patch is made thicker and more elaborate to protect the cocoons. Just like the Sparassids, some Attids bind the margins of one or two contiguous leaves and live within. Others hunt in the grass and imitate the life of an Oxyopid. On more than one occasion, I have seen Attids living within the cast-away shells of garden snails. Once on breaking open an old pupa of a butterfly I was surprised to find an Attid residing comfortably within, with its cocoon. A life similar to that of a Hermit-Crab. Was it after feeding upon the original inmate that the spider used this covering as its house, or was it after

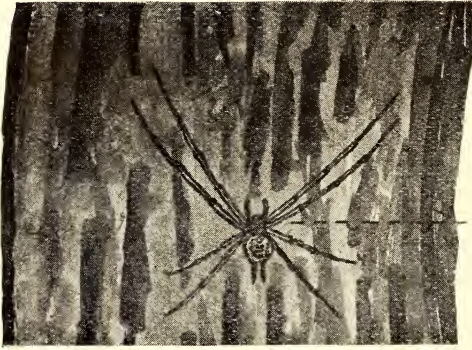


Fig. 1.—A Hersiliid spider on tree bark.

Hersiliids also are vigorous hunting spiders. As a rule they inhabit small holes and crevices in the bark of trees. They are also found in plenty on old walls. The species that hunt on old, white, mortar walls are generally pale white, quite in uniformity with the colour of the wall; while the more common species that occupy the tree trunks are brownish black, harmonizing with the colour of the bark. Add to this colour adaptation their peculiar posture: with a flat body and long-spread-out legs they adhere so closely to the surface that it is not easy to detect their presence at first sight (vide fig. 1). When pursued, they crawl sideways and up the tree trunk in an ascending spiral, leaving the pursuer disappointed alike.

Oxyopids are small or moderate sized spiders found abundantly among grass and small vegetable growths. They are better jumpers than runners and their sharp spined legs may be of some protective value. The more common species found in India are either *Peucitia viridiana* or *Peucitia elegans*. The light green or dull yellow colour of the body and the black spines on their legs agree so harmoniously

the emergence of the chrysalis that the spider met with the cast-away shell and converted it into a residence? If the former, it necessarily follows that the Attids also contribute to the destruction of Lepidopteran pupae. However so much is certain: among all the roving spiders, Attids seem to show the least discrimination in the selection of their residential quarters.



Fig. 2.—A Psechrid spider on grass.

with the surrounding ears and corns of the grass, that they are very safely hidden and difficult to detect. Remaining undetected by small insects the Oxyopid darts at and preys upon them. They have no webs of their own excepting in the breeding season when the female spins a small patch of silky web on the plant leaf to protect its cocoon. Oxyopids are common in rainy months when all sorts of vegetative growths spring up.

The *Psechridae*, another Order easily distinguished by the prominence of the first two pairs of legs, spend their lives amongst grass blades, just like the Oxyopids (Fig. 2).

Next come the Thomisids. Their general shape and architecture resemble those of a miniature crab. Like crabs they move sideways and are hence called Crab Spiders. Thomisids are generally small in size and are mostly preyed upon by other spiders. Perhaps



Fig—3. A Thomisid spider in a Bauhinia flower.

their lateral movements help them to escape from their enemies. I have seen an Attid spider pouncing on a Thomisid, but the former missed its prey as the latter escaped by a sideways somersault. Thomisids are often found resting inside flowers where their upward

thrust legs are easily mistaken for floral stamens (fig. 3). Flower visiting insects, like bees, become their easy prey. Thomisids include only a few species, compared with other groups, and even these few are but poorly worked out.

Clubionids are another group of hunting spiders. So also are the Sparassids. Both are found commonly in our gardens. *Olios tener*, a Clubionid rolls up leaves into a cylinder and resides within. By so doing it protects itself both from its enemies and from the sun and rain. *Palystes flavidus* is a Sparassid. It is green in colour and usually lives on the underside of leaves. Its colour is so near in tone to that of the leaf, that it is difficult to discover.

It will be observed from the foregoing that the colour scheme, mimicry and other adaptations—all have an important bearing upon the lives of spiders, since they enable them either to escape from their enemies or to secure their prey with less effort.

Who then are the enemies of spiders and what is their prey?

Of all the enemies of spiders, perhaps the most powerful are birds. Birds have a very keen vision and that peculiar habit of pecking at every small creature that comes within reach. Only after thorough experimental tasting do birds discriminate as to which spiders or insects are edible and which are not. Most spiders that are not protected either by warning colours or spiny coverings fall an easy prey to birds. Certain birds make judicious employment of spiders' silk in lining their nests.

House lizards like Geckos, often prey upon Pholcids and Theridiids, while Bloodsuckers (*Calotes*), skinks (*Mabuia*), and insectivorous mammals like shrews make a good meal of spiders inhabiting gardens.

Solitary and social wasps are the most vehement enemies of spiders. They persistently hunt them and store them up in their nests for the sustenance of their offspring.

Ants are also enemies of spiders; though the ant-mimic spiders are on friendly terms with them. The common red ants feed on the *Tetragnatha* and *Palystes*. The eggs of the Epeirans and other garden spiders are also sumptuously feasted upon by ants.

Spiders also should be regarded as the enemies of spiders. Cannibalism is a characteristic of this group.

I also know of a solitary instance of a Dragon-fly catching an Attid spider most probably for food.

As to food, spiders prey on almost all sorts of insects and other minute creatures. Web weaving spiders first bind their prey with silk, making it inert and powerless and then sucking out its juices. But vagabond and other webless spiders like Oxyopids, Lycosids, etc. seize their prey and feed on them direct. Aquatic flies and dragon flies and even small fishes constitute the food of water spiders.

There are numerous books on spiders written by ancient authors and although many of them are interesting, when dealing with the habits of spiders they display more of literary beauty than scientific fact.

McCook, in one of his works *American Spiders and their Spinning Work* (Philadelphia 1893), gives a splendid account of the habits

of spiders. The habits of *Lycosa* and *Epeira* have been dealt with in a very exhaustive way in J. H. Fabre's *Life of Spiders*. The researches of two American Arachnologists, George and Elizabeth Peckham are published under the title of 'On Mental Powers of Spiders' in the *Journal of Morphology* (Boston, U.S.A.) 1887, p. 403. Spiders are included also in works of general nature like *Intelligence of Animals* and *Protective Colours of Animals* written by authors like Houssary, Poulton, and a host of others. So far as the Indian Spiders are concerned a comprehensive and comparative work on the habits of Spiders is still wanting.

In writing this article I have only taken into consideration the more common genera of the Indian Archnomorphic Spiders. There must be equally interesting instances among the Mygalomorphic Spiders as well. Closer study of the habits of spiders will disclose yet more interesting examples of protective adaptation. 'Believing firmly from the evidence afforded by the causers that all animals are coloured in such a way as to best secure their safety and other interests, and not so as to expose them to danger, I am sure that as we progress we have found in every instance part of the great Creator's wonderful plan to ensure the welfare of His creatures and at the same time add brightness and beauty to the world.'—(T. Carreras.)